



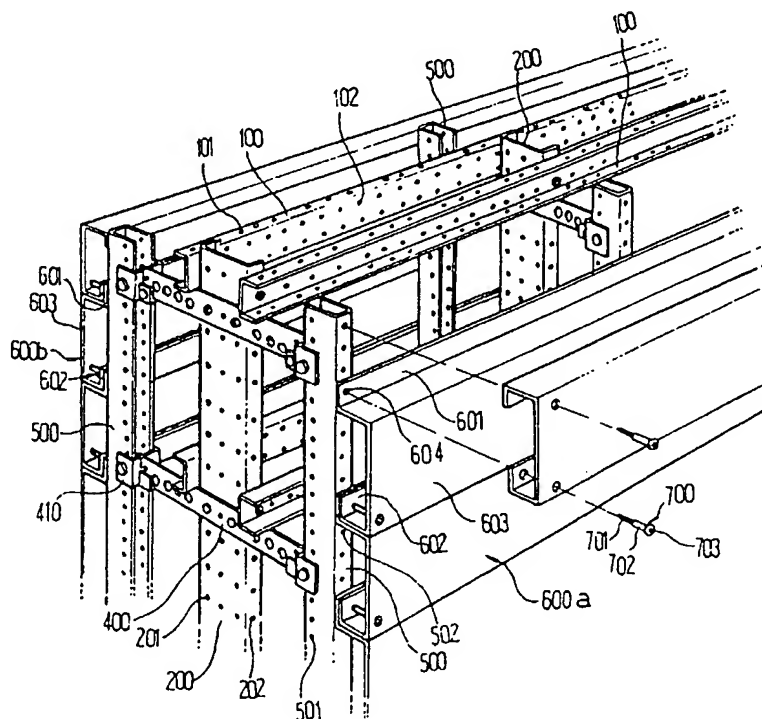
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: STEEL-FRAME STRUCTURE AND METHOD OF CONSTRUCTION BY USING THE SAME

## (57) Abstract

The invention concerns a steel frame structure and a method of construction by using the same in which the sectional steel-frame structure may be assembled and constructed rapidly and conveniently. The insulation board (300) is inserted between the horizontal members (100) and the vertical members (200), and fresh concrete is poured and cured in the interior/exterior plates (600a, 600b) engaged with both connecting members (400). The surface of the interior/exterior plates (600a, 600b) becomes smooth because the head (703) of the fastening means (700) is not protruded outward. It has an effect to simultaneously perform construction work of interior/exterior materials (600a, 600b) and insulation boards (300) and concrete pouring work during construction of the walls or slab, and removal work of the molds becomes unnecessary, so that construction time and construction cost may be reduced considerably.



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STEEL-FRAME STRUCTURE AND METHOD OF CONSTRUCTION  
BY USING THE SAME

TECHNICAL FIELD

5        This invention relates to a frame structure,  
preferably a steel frame structure and a method of  
construction by using the same, in which the frame  
structure is installed as a framework of buildings, and  
more specifically, to a sectional steel-frame structure  
10 and a method of construction by using the same in which  
the sectional steel-frame structure may be assembled and  
constructed rapidly and conveniently. By using the steel-  
frame structure, it is possible to simultaneously perform  
construction work of interior/exterior materials and  
15 insulation boards and concrete pouring work and the  
removal work of the molds is unnecessary, so that  
construction time and construction cost may be reduced  
considerably.

20        BACKGROUND ART

Generally, when construction of a frame structure for  
a concrete building is performed, reinforcing rods,  
section steels, beams, and the like are arranged in  
perpendicular and horizontal directions for inner and  
25 outer walls. Interior/exterior molding plates are  
installed at both sides of the arranged materials. Fresh  
concrete is poured in a mold formed as above. After the

poured concrete is cured in the molds, reinforcing rods are arranged on the cured concrete. Molding plates are installed on the reinforcing rod. Fresh concrete is poured in the molds to form a slab. When the inner and outer  
5 walls and slabs are formed completely, removal work of the mold and construction work of the insulation boards and interior/exterior materials are performed in order.

The conventional construction process will now be explained in more detail. In the construction of a  
10 building, after foundation work of the ground, reinforcing rods, section steels, beams, and the like are arranged on certain portions in the perpendicular and horizontal directions and the arranged reinforcing rods are linked each other. Wooden molds are usually installed on the  
15 inner and outer sides of the arranged reinforcing rods. The inner and outer molds may be supported by struts set up on respective outer surfaces of the interior/exterior molding plates or interval keeping means.

The conventional steel-frame structure and method of  
20 construction by using the same have, however, disadvantages that the struts and the interval keeping means are complicated to use. The struts must be respectively struck with big nails against the molding plates, making the installation and removal of the struts  
25 difficult. In addition, the interval keeping means must be fixed between the interior/exterior molds by passing through therebetween, which is time consuming.

Further, the conventional frame structure and method of construction by using the same have further problems that when the interior/exterior molding plates installed as above are removed after the walls and the slabs are  
5 completely cured as a concrete body, it takes a long time to remove the struts, the interval keeping means and the molding plates in order. Labor costs increase greatly in addition to the cost of subsidiary materials such as the molding plates, struts and interval keeping means.

10 Also, the conventional method of construction has still further problems that construction costs increase considerably due to extensions in construction time and the heavy expense of labor costs, since the construction works of the inner and outer walls, the insulation boards,  
15 and the interior/exterior materials are performed not simultaneously but separately in such a manner that the insulation boards are installed inside an outer wall after construction work of the inner and outer walls and slabs, the construction work of the insulation work for  
20 installing insulation plates inside the outer walls and piling of bricks, and the interior/exterior materials are performed in order.

Korean patent application 96-54011, Reg. No. 189216, (referred to Prior Art) by this applicant has suggested an  
25 improvement of the steel-frame structure wherein it is possible to simultaneously construct work of interior/exterior materials and insulation boards with the

concrete pouring work upon completion of the steel-frame structure, and as a result, construction time can be reduced.

However, this prior art has another disadvantage that  
5 the interior/exterior plates are assembled only at the portions where the brackets having the screw holes are engaged. Further, the engagement bolt is exposed outward the steel interior/exterior material plates, thereby causing the rough surface.

10

#### DISCLOSURE OF THE INVENTION

The present invention is made to solve the disadvantages of the prior art and has an object to provide a sectional steel-frame structure and a  
15 construction method in simultaneously performing the construction work of the interior/exterior materials and the insulation board in which the interior/exterior plates serving as steel molds are installed for engagement at any position from upper to lower portions and a head of the  
20 engagement bolt is not exposed outward to prevent the surface from being rough, thereby considerably reducing construction expenses and labor cost.

According to the present invention, there is provided a steel-frame structure comprising vertical members,  
25 horizontal members, connecting members of which center is engaged on the surface of the vertical members, supporting members in engagement with brackets at both end portions

of the connecting members, interior/exterior panel plates in engagement with the supporting members, and fastening means engaged on the surface of the panel plates without protruding the head of the fastening means.

5 In the present invention, the insulation board is inserted between the horizontal member and the vertical member, and fresh concrete is poured and cured therebetween with the interior/exterior material plates at both ends of the connecting members. The surface of the  
10 interior/exterior plates becomes smooth because the head of the fastening means is not protruded outward. In addition, the removal work of the molds is unnecessary, so that construction time and construction cost are reduced considerably.

15

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinafter and the accompanying drawing which is given by way of  
20 illustration only, and thus is not a limitation of the present invention, and wherein:

Fig. 1 is a perspective view showing a sectional steel-frame structure according to an embodiment of the present invention;

25 Fig. 2A is a plan view illustrating the molding process for simultaneously performing construction of insulation boards and interior/exterior materials by using

a steel-frame structure according to the preferred embodiment of the present invention;

Fig. 2B is a plan view illustrating the molding process for pouring concrete into the structure of Fig.

5 2A;

Fig. 3 a side view showing a sectional steel-frame structure according to an embodiment of the present invention;

Fig. 4 is a side view showing an engagement of the interior/exterior panel plates and the connecting members;

Fig. 5A is a perspective view showing a disengagement of the bracket and the connecting members; and

Fig. 5B is a perspective view showing an engagement of the bracket and the connecting members of Fig. 5A.

15

#### BEST MODE FOR CARRYING OUT THE INVENTION

In Fig. 1, a sectional steel-frame structure according to the present invention has vertical members 200, horizontal members 100, connecting members 400 of which center is engaged on the surface of the vertical members 200, supporting members 500 in engagement with brackets at both end portions of the connecting members 400 and interior/exterior plates 600a and 600b assembled to the supporting member 500.

25 The vertical members 200 and the horizontal members 100 are section steel materials in the shape of a bracket "U" and have a number of holes perforated along surfaces



thereof at regular intervals in a longitudinal direction and a number of holes perforated along two end parts at regular intervals in a longitudinal direction. The insulation board 300 is inserted in the insertion groove  
5 of the assembled horizontal members 100 and the vertical members 200 as shown in Fig. 2A.

The connecting member 400 has a number of holes 401 perforated on surface thereof at regular intervals in a lateral direction in order to be fixed to the vertical  
10 member 200. At both ends of the connecting member 400 brackets 410 are located, each having a hole 411 as shown in Figs. 5A and 5B.

The supporting member 500 in the shape of a bracket "U" has a number of holes 511 along two end parts in a  
15 longitudinal direction. The holes 511 coincide with the holes 411 perforated on the bracket 410. On surface thereof a number of holes 502 are formed at regular intervals in the longitudinal direction, so that the interior/exterior plates 600a and 600b are engaged through  
20 the holes 502.

The interior/exterior plates 600a and 600b are formed with two bent end parts. One inner bent end part 601 being in contact with the supporting member 500 is interposed with the other outer bent end part 602 of another  
25 interior/exterior plate, while the surface 603 is to be maintained in plane with repeated assembly. The inner and outer bent end parts 601 and 602 have holes 604 and 605

through which the screw 701 can pass but not the body 702. On the surface 603, insertion holes 606 are formed to coincide with the holes 604 and 605 through which the head 703 of the fastening means 700 can pass.

5           A method of construction by using the sectional steel-frame structure as above will be explained in more detailed.

**<First process to construct the main frame>**

10           A number of vertical members 200 are installed with a predetermined interval on ground. Horizontal members 100 are fixed to coincide the holes 102 and 202 to be engaged by riveting or bolting through the holes. The horizontal members 100 are engaged at desired positions from bottom  
15 to top of the vertical members 200, to complete the main frame work.

**<Second process to insert the insulation board>**

The insulation board 300 is inserted in the space between the horizontal member 100 and the vertical member  
20 200 as shown in Fig. 2A.

**<Third process to engage the supporting member>**

After completion of the main frame structure, a number of connecting members 400 are engaged with the vertical members 200 to coincide the hole 401 in the  
25 middle of surface thereof with the hole 201 of the vertical member 200 by riveting or bolting through the

holes.

The supporting member 500 is fixed at the bracket 410 of the upper connecting member 400 and at the bracket 410 of the lower connecting member 400 to coincide with the  
5 holes 411 and 501 by riveting or bolting. To repeat this work at the brackets 410 of each rows ensures the engagement of the supporting member 500.

**<Fourth process to construct the interior/exterior plates>**

10 At both supporting members 500 interior/exterior plates are fixed from the lower parts. Specifically, the inner bent end part 602 of the interior plate 600a is interposed with the outer bent end part 601 of another interior plate 600a, and the inner bent end part 602 of  
15 the exterior plate 600b is interposed with the outer bent end part 601 of another exterior plate 600b, so that the fastening means 700 is inserted by nailing to fix therebetween through the holes 604 and 605 which coincide with the hole 502 perforated on the surface of the  
20 supporting member 500.

Referring to Fig. 4, the screw 701 of fastening means 700 is nailed to the hole 502 through the groove 605, but the body 702 having larger diameter than the screw is not nailed. The head 703 of the fastening means 700 is fixed  
25 to the holes 604 and 605 formed on the interior/exterior plates 600a and 600b, so that the head 703 of the engaging means 700 stops up the insertion hole 606. The preferred

length of supporting member 500 according to the present invention is long and the engagement with the interior/ exterior plates 600a and 600b are readily made at any desired position. The length of the supporting member is  
5 not restrictive in the invention.

The head 703 of the fastening means 700 is not protruded from the interior/exterior plates 600a and 600b and is completely filled with the insertion holes 606 (Fig. 3), which prevents the rough surface. This also functions  
10 to prevent the concrete from being leaked through the insertion holes 606.

**<Fifth process to pour the concrete>**

After the steel-frame structure as above is completed, the fresh concrete is poured and filled as shown in Fig.  
15 2B. The concrete is cured with the insulation board 300 therein. On the inner and outer sides of the wall the interior/exterior plates 600a and 600b are constructed together with the structure.

The insulation construction work may be performed at  
20 any time before pouring the concrete, i.e., after assembling the supporting member 500 or after assembling the interior/exterior plates 600a and 600b.

The steel-frame structure of the present invention  
25 enables to simultaneously perform the insulation work and inner/exterior plates work and it becomes unnecessary to remove the molding, thereby shortening the construction

period.

It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.

10      EFFECT OF THE INVENTION

In a steel-frame structure and a method of construction by using the same according to the present invention, the sectional steel-frame structure may be assembled and constructed rapidly and conveniently. By using the steel-frame structure, it is possible to simultaneously perform construction work of interior/exterior materials and insulation boards and concrete pouring work, so that construction time and construction cost may be reduced considerably.

## CLAIMS

## 1. A steel-frame structure comprising:

- horizontal members (100) and vertical members (200)  
5 of section steel materials in the shape of "U" bracket,  
assembled by a number of holes (101, 102; 201, 202)  
perforated on surfaces at regular intervals in a  
longitudinal direction and two end parts at regular  
intervals in a longitudinal direction;
- 10 insulation board (300) inserted in the insertion  
space between the assembled horizontal members (100)  
and vertical members (200);
- connecting members (400) with a number of holes  
(401) perforated on surface thereof at regular  
15 intervals to be engaged on surface of the vertical  
member (200), and a pair of brackets (410) having a  
hole (411) to form a lattice by riveting or bolting  
through the hole;
- supporting members (500) having a number of holes  
20 perforated along surfaces thereof at regular intervals  
in a longitudinal direction and a number of holes 501  
perforated along two end parts at regular intervals in  
a longitudinal direction, the supporting members being  
formed from elongated steel sections having a bracket  
25 shape; and
- panel members (600a, 600b) serving as an  
interior/exterior plates, assembled by fastening means

(700) with the supporting members (500); wherein

the brackets are fixed on the supporting members by riveting or bolting through the holes of the brackets and the holes of the surfaces of the supporting members.

5

2. A steel-frame structure as claimed in claim 1,

wherein said panel members (600a, 600b) have the bent parts (601, 602) to have holes (604, 605) at both ends

to ensure a surface (603) to be maintained in plane;

10 insertion holes perforated on the surface (603); and

the fastening means (700), said fastening means (700)

includes a screw (701) to be engaged with the holes

(604, 605), body (702) having a larger diameter than

the screw and being stopped up with the bent parts (601,

15 602), and a head (703) filled with the insertion hole (606).

3. A method of constructing using a sectional steel-frame structure, comprising the steps of:

20 first process of assembling the sectional steel-frame structure to form a lattice by installing a number of vertical members (200) on ground to engage with a number of horizontal members (100) at desired positions by riveting or bolting through the holes;

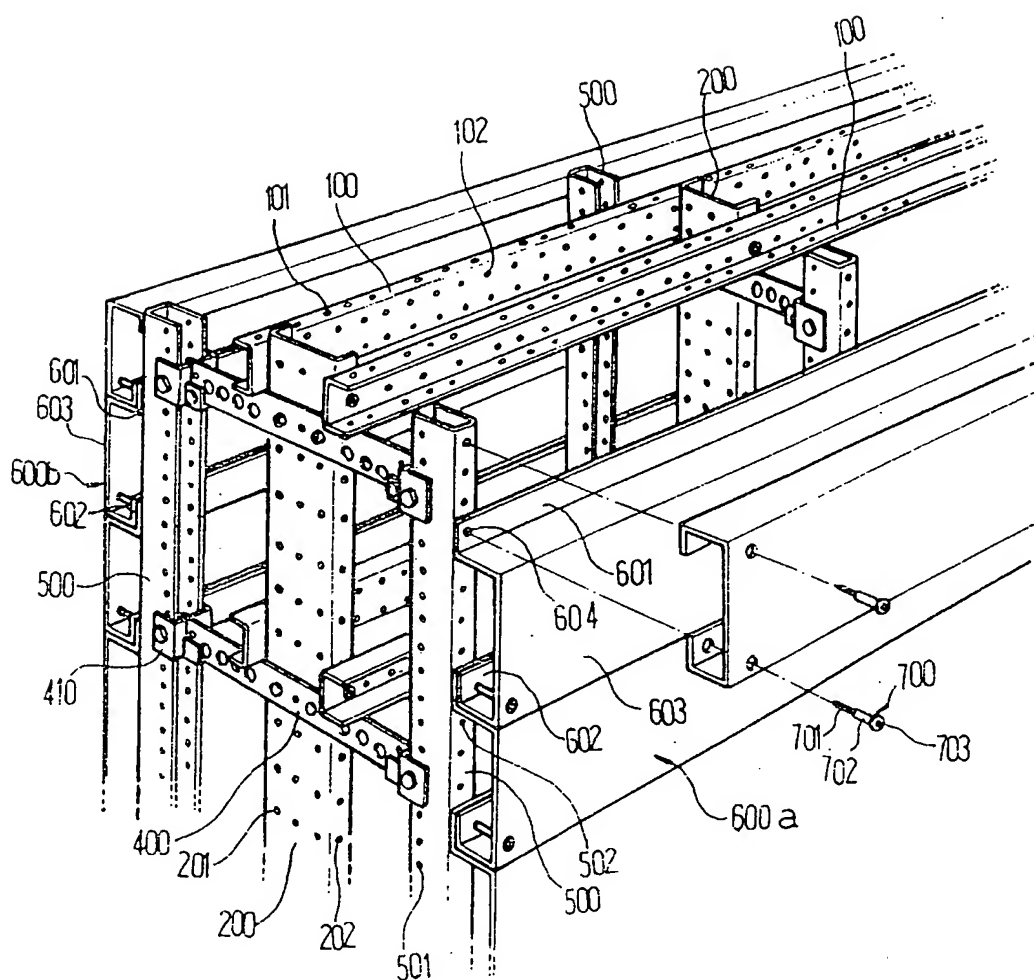
25 second process of inserting the insulation board (300) in the insertion space between the vertical members (200) and the horizontal members (100);

third process of assembling a plurality of  
connecting members (400) having the brackets (410) at  
both ends thereof at regular intervals on the surface  
of the vertical members (200), and engaging the  
5 connecting members (400) with the supporting members  
(500) in a longitudinal direction;

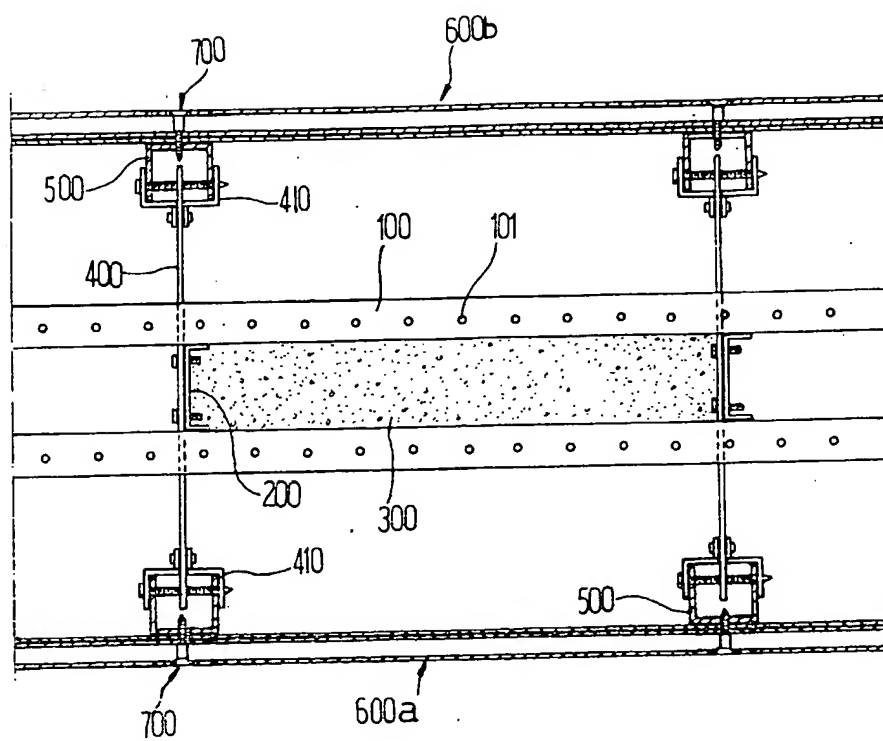
fourth process of repeatedly assembling the panel  
members (600a, 600b) on the surfaces of both supporting  
members (500) upon completion of said third process;  
10 and

fifth process of pouring the fresh concrete into  
the assembled steel-frame structure.



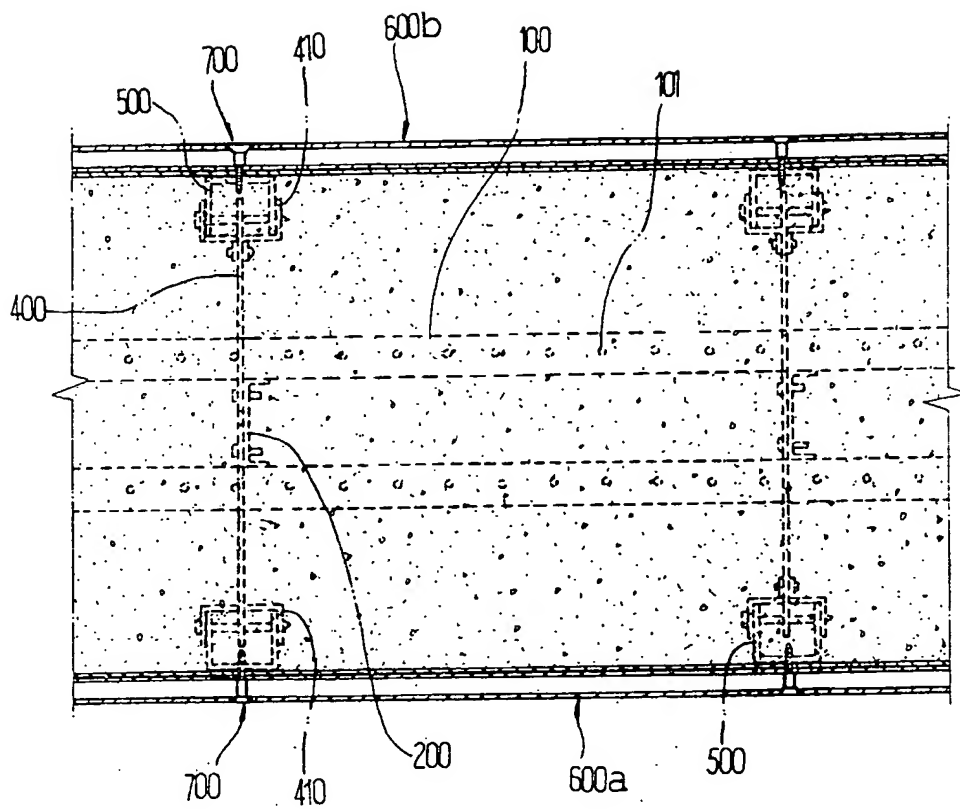
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**FIG. 1**

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**FIG. 2A**

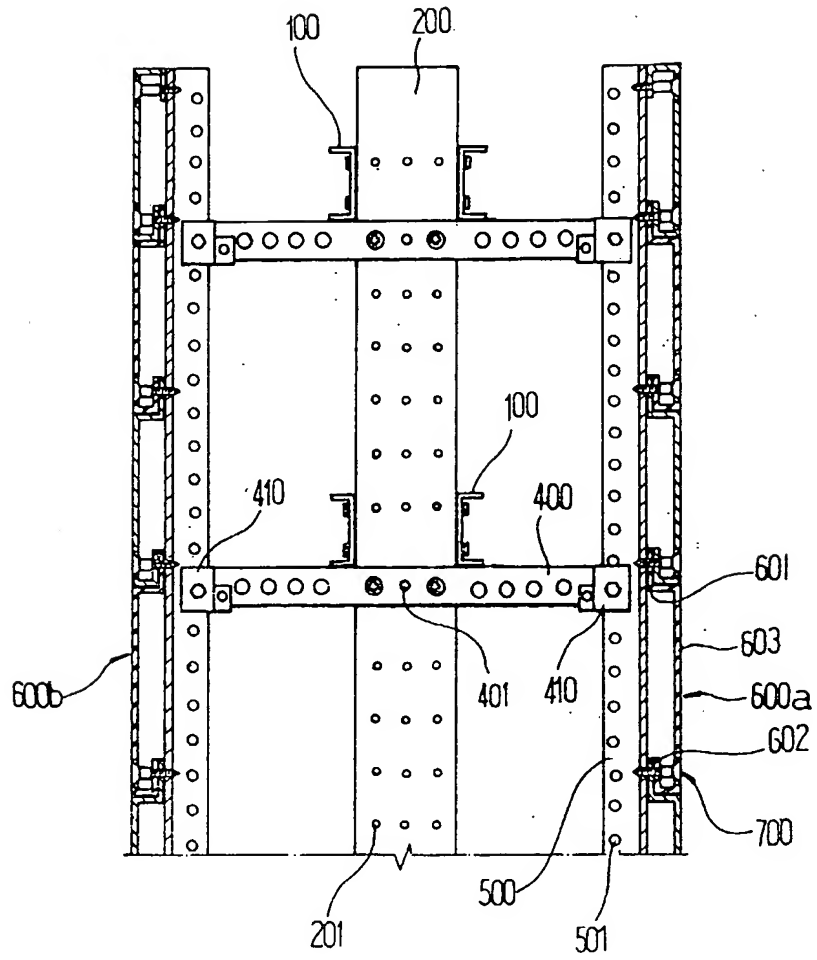
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**FIG. 2B**



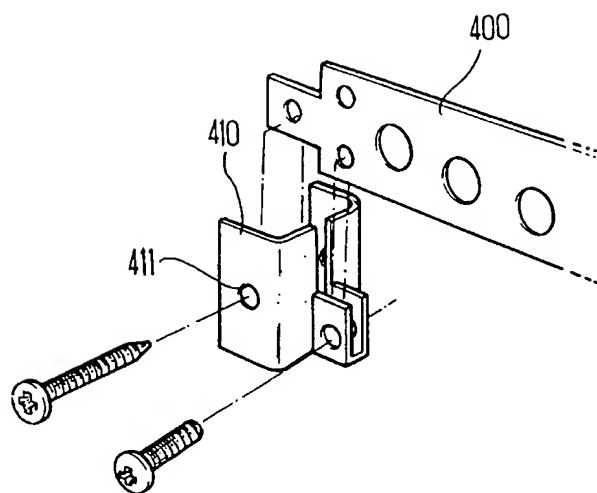
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FIG. 3

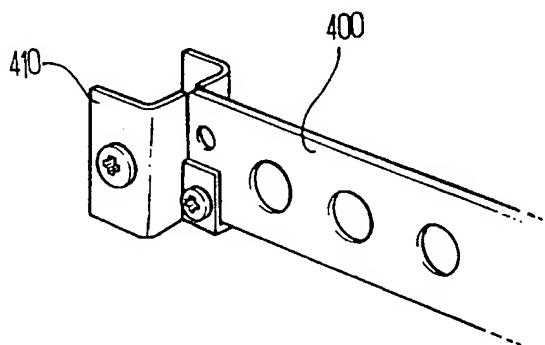




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**FIG. 5A**



**FIG. 5B**



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/KR 00/00382

## CLASSIFICATION OF SUBJECT MATTER

IPC<sup>7</sup>: E 04 B 2/86, 2/58

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC<sup>7</sup>: E 04 B 2/58, 2/86

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 3418687 A1 (STRELOW) 21 November 1985 (21.11.85) fig.1.	1
A	FR 2267429 A (LE BRUN) 7 November 1975 (07.11.75) fig.	1
A	WO 93/22519 A1 (RAUTARUUKKI OY) 11 November 1993 (11.11.93) fig.2,4A.	1
A	DE 7615533 U (REINOLD) 23 September 1976 (23.09.76) fig.4.	1,2
A	DE 4308874 A1 (LETHE-METALLBLAU) 23 November 1993 (23.11.93) fig.23,26.	2
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☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

## \* Special categories of cited documents:

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Date of the actual completion of the international search

7 June 2000 (07.06.2000)

Date of mailing of the international search report

31 July 2000 (31.07.2000)

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**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/KR 00/00382

Document DE 3418687 A1 shows a metal wall constructed of horizontal members (2) and vertical members (1a,1b).

Document FR 2267429 A shows panel members (1) made of asbestos cement with insulation boards (3) held by horizontal members (4) and vertical members (6).

Document WO 93/22519 A1 shows panel members (1,2) made of metal sheet with insulation boards (21) inserted within.

Document DE 7615533 U shows horizontal members (16,16a), vertical members (1) and connecting members (21) arranged to maintain panel members (23) in plane.

Document DE 4308874 A1 shows panel members (40,40a,40b) connected together with bent parts (45,145).



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR 00/00382

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
DE	A1	3418687	21-11-1985	none	
FR	A1	2267429	07-11-1975	none	
WO	A1	9322519	11-11-1993	AU A1 40420/93	29-11-1993
				DE C0 69312734	04-09-1997
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				FI C 91654	25-07-1994
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